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# EPA Evaluation of the Autosaver Under Section 511 of the Motor Vehicle Information and Cost Savings Act

Environmental Protection Agency
Ann Arbor, MI

May 81

U.S. Department of Commerce
National Technical Information Service
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# EPA Evaluation of the Autosaver under Section 511 of the Motor Vehicle Information and Cost Savings Act

by

Edward Anthony Barth

May, 1981

Test and Evaluation Branch
Emission Control Technology Division
Office of Mobile Source Air Pollution Control
Environmental Protection Agency

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15. SUPPLEMENTARY NOTES

16. ABSTRACT

This document announces the conclusions of the EPA evaluation of the "Autosaver" device under provisions of section 511 of the Motor Vehicle Information and Cost Savings Act.

On April 16,1980 the EPA received a request from Mr. Y. Mori for evaluation of a fuel saving device termed "Autosaver". This device is designed for use on conventional, contact point, ignition systems. This device is claimed to save fuel and reduce pollution by instantaneously providing the high voltage to the spark plugs in an "ideal" manner.

17. KEY WORDS AND DOCUMENT ANALYSIS

| a. DESCRIPTORS | b. IDENTIFIERS/OPEN ENDED TERMS | c. COSATI Field/Group |
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ENVIRONMENTAL PROTECTION AGENCY

[40 CFR Part 610]

[FRL _____]

# FUEL ECONOMY RETROFIT DEVICES

## Announcement of Fuel Economy Retrofit Device Evaluation for "Autosaver"

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice of Fuel Economy Retrofit Device Evaluation.

SUMMARY: This document announces the conclusions of the EPA evaluation of the "Autosaver" device under provisions of Section 511 of the Motor Vehicle Information and Cost Savings Act.

BACKGROUND INFORMATION: Section 511(b)(1) and Section 511(c) of the Motor Vehicle Information and Cost Savings Act (15 U.S.C. 2011(b)) requires that:

(b)(1) "Upon application of any manufacturer of a retrofit device (or prototype thereof), upon the request of the Federal Trade Commission pursuant to subsection (a), or upon his own motion, the EPA Administrator shall evaluate, in accordance with rules prescribed under subsection (d), any retrofit device to determine whether the retrofit device increases fuel economy and to determine whether the representations (if any) made with respect to such retrofit devices are accurate."

(c) "The EPA Administrator shall publish in the Federal Register a summary of the results of all tests conducted under this section, together with the EPA Administrator's conclusions as to -

(1) the effect of any retrofit device on fuel economy;

(2) the effect of any such device on emissions of air pollutants; and

(3) any other information which the Administrator determines to be relevant in evaluating such device."

EPA published final regulations establishing procedures for conducting fuel economy retrofit device evaluations on March 23, 1979 [44 FR 17946].

ORIGIN OF REQUEST FOR EVALUATION: On April 16, 1980 the EPA received a request from Mr. Y. Mori for evaluation of a fuel saving device termed "Autosaver". This Device is designed for use on conventional, contact point, ignition systems. This Device is claimed to save fuel and reduce pollution by instantaneously providing the high voltage to the spark plugs in an "ideal" manner.

Availability of Evaluation Report: An evaluation has been made and the results are described completely in a report entitled: "EPA Evaluation of the Autosaver Under Section 511 of the Motor Vehicle Information and Cost Savings Act," report number EPA-AA-TEB-511-81-3 consisting of 33 pages including all attachments.

Copies of this report may be obtained from the National Technical Information Center by using the above report number. Address requests to:

National Technical Information Center
U.S. Department of Commerce
Springfield, VA 22161
Phone: Federal Telephone System (FTS) 737-4650
Commercial 703-487-4650

Summary of Evaluation

EPA fully considered all of the information submitted by the Device manufacturer in the Application. The evaluation of the Autosaver device was based on that information.

The Applicant submitted no valid data to support the claim for improved fuel economy or reduced emissions. The Applicant was advised by letter on several occasions of EPA's requirement that the Applicants submit valid test data following the proper EPA test procedures.

Therefore, there is no technical basis to support any claims for a fuel economy improvement due to the use of the "Autosaver" device.

FOR FURTHER INFORMATION CONTACT: Merrill W. Korth, Emission Control Technology Division, Office of Mobile Source Air Pollution Control, Environmental Protection Agency, 2565 Plymouth Road, Ann Arbor, Michigan 48105, 313-668-4299.

_____
Date

_____
Edward F. Tuerk
Acting Assistant Administrator
for Air, Noise, and Radiation

Evaluation of the Autosaver Device Under Section 511 of the Motor Vehicle Information and Cost Savings Act

The following is a summary of the information on the device as submitted by the Applicant and the resulting EPA analysis and conclusions.

1. Marketing Identification of the Device:

"Autosaver"

2. Inventor of the Device and Patents:

A. Inventor

Dr. Giichi Mori
4-14-15, Mita, Minato-ku
Tokyo, Japan

B. Patent

U.S. Patent Office Serial Filing Number 127,200
Japanese Patent No. 997,312

3. Manufacturer of the Device:

Sanwa Kagaku Co., LTD.
4-15-36 Mita, Minato-ku, Tokyo, Japan
Yamura Shinko Seisakujo (KK)
4-14-15 Mita, Minato-ku, Tokyo, Japan

4. Manufacturing Organization Principals:

Dr. Giichi Mori

5. Marketing Organization in U.S. Making Application:

Sanwa Kagaku (U.S.A.) Inc.
Empire State Bldg. Suite 5620
New York, NY 10001
212-564-3536

6. Identification of Applying Organization Principals:

Mr. Y. Mori, President

7. Description of Device (as supplied by Applicant):

A. Purpose of the Device: "Reduce HC, CO and fuel consumption."

B. Theory of Operation: "Please refer to enclosed explanation of this patent."(1)

---

(1) "Summary of the Invention" extracted from patent description by EPA.

"According to the present invention, a resistor having a low value of resistance and a nonlinear electrical device, such as a gas-filled discharge tube, are connected in series with each other and in parallel with a capacitor which in turn is coupled with the primary winding of an ignition coil and shunted across a contact breaker. With such an arrangement, a desired high voltage can be generated instantaneously for completely burning air-fuel mixture in engine cylinders.

"It is an object of the present invention to provide an ignition system for an internal combustion engine, which can control changes in current when the contact breaker is opened and closed, so as to prevent damages to the contacts of the contact breaker and supply a desired high voltage instantaneously to the spark plugs.

"Another object of the present invention is to provide an automotive ignition system for igniting the air-fuel mixture in an ideal mode to reduce the cost of fuel and to hold polluting substances in the exhaust gas at a minimum."(1)

C. Detailed Description of Construction and Operation (as supplied by Applicant): "Same as above B."

8. Applicability of the Device (as supplied by Applicant):

"All kinds of cars, as long as cars have ignition systems."

9. Device Installation, Tools and Expertise Required (as supplied by Applicant):

"Please refer to Fig. (1)." Figure 1 is Attachment B.

"Installation of Auto Saver is quite simple.

1. To install the Auto Saver by connecting the lead wire with (+) and (-) terminals of Primary Line (low voltage).

2. To be careful not to have Primary line touch the Secondary line, and also at the same time, be careful not to let it slacken down."

More complete installation instructions and a diagram depicting proper installation are provided in Attachment B of this evaluation.

10. Device Operation (as supplied by Applicant):

"Same as Item 10." Item 10 referred to Figure 1.

11. Device Maintenance (as supplied by Applicant):

"No tools is required. No maintenance up to min. 30,000 miles."

12. Effect on Vehicle Emissions (non-regulated) (as supplied by Applicant):

"Reduce HC & CO. Please refer to attached data." Reference Attachment C of this evaluation for data provided by Applicant in Japanese for which the Applicant also provided an English translation.

13. Effects on Vehicle Safety (as supplied by Applicant):

"Through past 8 years experience, we found out that we can gurantee 100 per cent safty."

14. Test Results - Regulated Emissions and Fuel Economy (submitted by Applicant):

"Please refer to attached data." See Attachments C and D.

15. Analysis

A. Description of the Device:

The Device was judged to be not sufficiently well described so as to permit a complete understanding of its theory of operation and physical embodiment. There were inconsistencies in the patent, installation instructions, and accompanying figures. The Applicant did not respond to EPA's requests for information to resolve these differences. See Attachment G.

B. Applicability of the Device:

The applicability of the device, as stated in the application, Section 8, is for all cars with ignition systems. However, the Patent describes a device for use only with conventional contact breaker point electrical ignition systems. The Applicant was requested to clarify this apparent discrepancy in a letter dated November 28, 1980, Attachment G. However, the letter was returned by the Post Office as undeliverable since the Applicant was no longer at the address specified and had provided no forwarding address.

Therefore, the "Autosaver" device, as described, is judged to be only applicable to conventional contact breaker point electrical ignition systems and not to all ignition systems as claimed.

This device, therefore, is not applicable to the solid state, high energy, electronic ignition systems used in most vehicles sold in recent years.

Note: The Applicant did submit test data (Attachment D) on a vehicle that is normally equipped with a solid state, high energy, ignition system. However, the Applicant did not

respond to a request for more specific information on the Device test installation (Attachment G).

C. Device Installation - Tools and Expertise Required:

The installation instructions (Attachment B) were conflicting as to the proper installation hookup. The instructions specified connection to the two ignition terminals yet showed a hookup to the ignition coil negative terminal and ground. The patent application (Attachment A) text agreed with the installation figure but showed a still different electrical hookup. EPA was unable to contact the Applicant to resolve these differences.

If the above installation inconsistencies are able to be resolved, the Device should be able to be installed by persons with minimal mechanical skills. Installation would require a wrench and possibly a drill.

D. Device Operation:

Section 10 referenced the information contained in Attachment B. This contained no operating information other than an estimated operating lifetime of 3 to 5 years.

E. Device Maintenance:

The Applicant specified "No maintenance up to minimum 30,000 miles." Although this may be true in the general sense, the electrical wiring and connections would require the vehicle operator to perform the same periodic, albeit infrequent, maintenance accorded similar vehicle components.

The Applicant's statements about maintenance and durability of the Device imply that, when the gas discharge tube contained in the Device failed after an estimated 3 to 5 years, it would be serviced. Such is not the case. The tube is enclosed by the sealed case and no instructions were provided for the tube installation.

F. Effects on Vehicle Emissions (non-regulated):

The Applicant did not respond to this Section of the Application Format. The information supplied in Section 12 was for regulated emissions.

However, since the Device is only claimed to modify the ignition firing voltage, it is judged to be unlikely to affect unregulated emissions.

G. Effects on Vehicle Safety:

Applicant claims to have encountered no safety problems, Section 13.

The device is therefore judged to have no safety problems since, even in the event of a catastrophic failure (i.e. internal short circuit), the most probable effect would be to disable the vehicle's ignition system thereby preventing the vehicle from operating.

H. Test Results Supplied by Applicant:

Applicant did submit a limited amount of test data per the Federal Test Procedure or Highway Fuel Economy Test. These are the only EPA recognized test procedures(2). This requirement for test data following these procedures is stated in the application test policy documents that EPA sends to potential applicants. The test data submitted by the Applicant are listed below and evaluated.

(1) The Applicant provided test data on one vehicle per the FTP and HFET (Attachment D). However, when requested to answer specific questions about these tests (Attachment G), the Applicant did not respond (mail was returned by Post Office as undeliverable with no forwarding address).

Also, EPA requires such a test sequence to be performed on a minimum of two vehicles.

(2) The Applicant provided test data written in Japanese. Only one data set was translated (see Attachment C) and additional information was needed for this set of data. Again, the Applicant failed to respond to the request for more information (Attachment G).

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(2) From EPA 511 Application test policy documents:

Test Results (Regulated Emissions and Fuel Economy):
Provide all test information which is available on the effects of the device on vehicle emissions and fuel economy.

The Federal Test Procedure (40 CFR Part 86) is the only test which is recognized by the U.S. Environmental Protection Agency for the evaluation of vehicle emissions. The Federal Test Procedure and the Highway Fuel Economy Test (40 CFR Part 600) are the only tests which are normally recognized by the U.S. EPA for evaluating vehicle fuel economy. Data which have been collected in accordance with other standardized fuel economy measuring procedures (e.g. Society of Automotive Engineers) are acceptable as supplemental data to the Federal Test Procedure and Highway Fuel Economy Data will be used, if provided, in the preliminary evaluation of the device. Data are required from the test vehicle(s) in both baseline (all parameters set to manufacturer's specifications) and modified forms (with device installed).

16. Conclusions

EPA fully considered all of the information submitted by the device manufacturer in the application. The evaluation of the "Auto Saver" device was based on that information. The Applicant provided no valid data to support the claim for improved fuel economy or reduced emissions. The Applicant was advised by letter and phone on several occasions of EPA's requirement that Applicants submit valid test data following the proper EPA test procedures.

Attempts to contact the Applicant to resolve discrepancies and clarify the information provided were futile since the Applicant had moved and had left no forwarding address.

Therefore, there is no technical basis to support any of the Applicant's claims for fuel economy improvement or reduced emissions due to the "Auto Saver" device.

List of Attachments

| | |
|---|---|
| Attachment A | Patent Application (provided with 511 Application) |
| Attachment B | Auto Saver Installation Instructions and claimed benefits (provided with 511 Application) |
| Attachment C | English translation of Japanese test results (provided with 511 Application) |
| Attachemnt D | AESI test result letter dated July 8, 1980 provided by Applicanc |
| Attachment E | EPA letter dated January 19, 1980 |
| Attachment F | EPA letter dated November 7, 1980 |
| Attachment G | EPA letter dated November 28, 1980 |

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March 3, 1980

Kinutani & Co.
Atagoyamabengoshi Building
1-6-7, Atago,
Minato-Ku, Tokyo 105, JAPAN

ATTENTION: Mr. Nobuo Kinutani

RE: New United States Patent Application
Inventor: Giichi Mori
"IGNITION SYSTEM FOR AN INTERNAL COMBUSTION ENGINE"
Our Ref. KIN-100-A

Dear Mr. Kinutani:

We wish to acknowledge receipt of your letter of February 25 forwarding the revised original application having the executed Declaration affixed thereto.

We are pleased to report that the subject application, including the specification, set of claims, abstract, Declaration and Power of Attorney and two sheets of formal patent drawings containing Figs. 1-5, has already been dispatched to the U. S. Patent and Trademark Office by Express Mail for filing.

The filing particulars will be reported to you in due course.

Very truly yours,

DR. IRVING M. WEINER

IMW/cf

KINUTANI & CO

PATENT, DESIGN AND TRADEMARK ATTORNEYS

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TEL. TOKYO (438) 3744
CABLE:KINUTANIPAT TOKYO

Attachment A

March 24, 1980

Mr. Giichi Mori
4-14-15, Mita, Minato-ku,
Tokyo, Japan

Dear Sirs,

Re : New U. S. Patent Application
"IGNITION SYSTEM FOR AN INTERNAL COMBUSTION ENGINE" ( AUTO SAVER )
Corrsponding to Japanese Patent Application No. 12620/1980 ( filed on Februaray 5, 1980 )
and basic Japanese Patent No. 997,312

We are enclosing herewith each copy of letter dated March 3, 1980 and TLXs dated March 20, 1980 and March 24, 1980 which received from our agent firm, IRVING M. WEINER, P. C. of 3000 Town Center, Suite 1145, Southfield, Michigan 48075 U. S. A.

We are pleased to inform you that the above-identified U. S. Patent Application has been filed on the date of March 4, 1980 to the U. S. Patent Office and issued the filing certificate under the serial filing number 127,200 from the U, S. Patent Office.

The filing certificate will be sent to you when received from our foreign agent.

If you need any other information from us, please let us know.

Very truly yours,

KINUTANI & CO.

N. Kinutani

Nobuo Kinutani, Patent Attorny

Field of the Invention:

The present invention relates to an ignition system for an internal combustion engine, and more particularly to an ignition system for an automotive engine using as fuel gasoline or LP gas and which is required to save the fuel and to reduce polluting elements in the exhaust gas which are caused by the insufficient or incomplete burning of the fuel.

Background of the Invention:

Conventional ignition systems include a capacitor of about 0.2 MF coupled in parallel with a contact breaker in order to burn the fuel completely in the engine cylinder. However, such a capacitor has too small a capacitance value to take up fully and instantaneously the counter electromotive force generated when the contact breaker is opened. Consequently, the contact breaker cannot be opened at high speeds, and its contacts tend to become damaged.

With a high-capacitance capacitor, the contact breaker can be opened rapidly in an ideal condition, thereby allowing the ignition coil to generate a desired high voltage. However, because the energy stored in the capacitor is relatively large, an excessive amount of current flows through the contacts as the contact breaker is closed, with the result that the contacts can become damaged in a short period of time.

Summary of the Invention

According to the present invention, a resistor having a low value of resistance and a nonlinear electrical device, such as a gas-filled discharge tube, are connected in series with each other and in parallel with a capacitor which in turn is coupled with the primary winding of an ignition coil and shunted across a contact breaker. With such an arrangement, a desired high

voltage can be generated instantaneously for completely burning air-fuel mixture in engine cylinders.

It is an object of the present invention to provide an ignition system for an internal combustion engine, which can control changes in current when the contact breaker is opened and closed, so as to prevent damages to the contacts of the contact breaker and supply a desired high voltage instantaneously to the spark plugs.

Another object of the present invention is to provide an automotive ignition system for igniting the air-fuel mixture in an ideal mode to reduce the cost of fuel and to hold polluting substances in the exhaust gas at a minimum.

The above and other objects and advantages of the present invention will become apparent from the following description when taken in conjunction with the accompanying drawings.

Brief Description of the Drawings

Fig. 1 is a circuit diagram of an ignition system for an internal combustion engine, provided in accordance with an embodiment of the present invention;

Fig. 2 and 3 are graphs showing waveforms of currents flowing through an ignition coil when a contact breaker is closed and opened, respectively;

Fig. 4 is a graph showing an ideal waveform of a current flowing through an ignition coil; and

Fig. 5 is a graph illustrative of relationships between the air-fuel ratio and the exhaust gas with internal combustion engines, one having an ignition system of the present invention and the other not.

Detailed Description

As shown in Fig. 1, an ignition system according to the

present invention comprises an ignition coil including a primary winding 2 connected in series with a battery 1 and a capacitor 3. A contact breaker 4 is connected across the capacitor 3. A resistor 5 and a nonlinear electrical device, such as a gas-filled discharge tube 6, which are connected in series with each other, are also connected across the capacitor 3. The resistor 5 has a low value of resistance. The resistor 5 may comprise a variable resistor having a variable low value of resistance.

One of the terminals of the contact breaker 4 is grounded, and the other terminal thereof is connected to a terminal of a secondary winding 7 of the ignition coil. The other terminal of the secondary winding 7 is coupled to a high-tension terminal of a distributor 9 for supplying a high voltage to a plurality of spark plugs 8.

Assuming that the primary winding has an inductance L and a current $\underline{i}$ flows therethrough when a voltage is applied thereacross by closing the contact breaker 4, a counter electromotive force expressed by $L\frac{di}{dt}$ is generated across the primary winding. Thus,

$$E = Ri + L\frac{di}{dt} \qquad (1)$$

where R is the resistance of the primary winding.

When the contact breaker 4 is closed, the current $\underline{i}$ changes transiently in accordance with the following equation:

$$i = \frac{E}{R}\left(1 - \varepsilon^{-\frac{R}{L}t}\right) \qquad (2)$$

This transient current can be illustrated by the waveform in Fig. 2.

As the contact breaker 4 opens, E becomes zero and hence

$$L\frac{di}{dt} + Ri = 0 \qquad (3)$$

Therefore, $$i = \frac{E}{R}\varepsilon^{-\frac{R}{L}t} \qquad (4)$$

The current i is attenuated down to zero.

With such changes in current as the contact breaker 4 is opened or closed, a high voltage is induced across the primary winding 2 of the ignition coil, which has a substantially high impedance.

Ideally, a high voltage should appear only during those intervals in which the current flows instantaneously as shown in Fig. 4. However, the voltage and current is established upon lapse of a predetermined interval of time, and dt in the equation (1) cannot become zero. No waveform as illustrated in Fig. 4 can thus be obtained. By reducing dt during which the current changes, however, an ideally high voltage can be generated across the primary winding 2, with the result that a high voltage can be induced across the secondary winding 7 of the ignition coil.

Such a condition can be accomplished by shunting the capacitor 3 with the series-connected resistor 5 and the gas-filled discharge tube 6. During discharging, the gas-filled discharge tube 6 has a very small internal resistance, and hence can take up a counter electromotive force generated by the opening of the contact breaker 4, thereby allowing a sufficiently high voltage to be induced instantaneously across the secondary winding 7 of the ignition coil. When the contact breaker 4 is closed, the voltage across the capacitor 3 is not great enough to discharge the discharge tube 6. Thus, the internal resistance of the discharge tube 6 becomes very high at this time, allowing only the capacitor 3 to be discharged. The contacts of the contact breaker 4 are therefore protected from being severely damaged.

With the value of the resistor 5 being selected such that

the discharge tube is stably energizable according to its negative discharging characteristic, the discharge tube, when it starts discharging due to an applied varying voltage, allows a very large current to flow instantaneously. Such a sharp rise in pulsed current assures high-speed ignition and rapid take-up of excess voltage generated when the discharge tube is discharged.

An experiment has been conducted with an ignition system of the present invention using a 3000 ohm resistor for the resistor 5 and a gas-filled discharge tube rated at 60 volts, and 6.0 - 6.2 milliamperes. An automotive gasoline engine having a displacement of 1400 - 1800 cubic centimeters equipped with such an ignition system, and another similar automotive gasoline engine equipped with a conventional ignition system have been tested and compared with each other for the relationship between the air-fuel mixture ratio and the exhaust gas. The results are shown in Fig. 5.

The automotive gasoline engine without the ignition system of the present invention was first operated at an idling speed of 600 r.p.m. Care was taken to maintain this number of revolutions per minute, because as the number of revolutions increases, the density of carbon monoxide (CO) in the exhaust gas is reduced. The idle mixture screw of the carburetor was then turned to make the air-fuel mixture progressively leaner until the engine stopped. The density of CO was measured at intervals, and the density of nitrogen oxides (NOx) has also been measured correspondingly. The measurements are indicated by the curves B and D of Fig. 5. Next, the engine with the ignition system of the present invention was operated and measured for CO and NOx according to the same procedure.

The curves of Fig. 5 indicate that the gasoline engine with spark delay adjustment emits exhaust gas containing NOx of low density, and that the gasoline engine with the present ignition system emits exhaust gas containing NOx of generally low density over various air-fuel ratios as shown by the curve A. The maximum value of NOx density on the curve A is reached at the air-fuel ratio of 16:1, and is reduced by about 32% as compared with the maximum value on the curve B.

Furthermore, an engine with the present ignition system can be operated with a much leaner air-fuel mixture than engines having conventional ignition systems. Also, the density of CO has been reduced with the engine having the present ignition system as illustrated by the curve C of Fig. 5.

Although a certain preferred embodiment has been shown and described in detail, it should be understood that many changes and modifications may be made therein without departing from the scope of the appended claims.

## CLAIMS

- 1 -

An ignition system for an internal combustion engine, comprising:

an ignition coil including a primary winding adapted to be connected to a battery, and a second winding adapted to be connected to a distributor;

a contact breaker connected in series with said primary winding;

a capacitor connected in series with said primary winding and in parallel with said contact breaker; and

a series-connected combination of a resistor and a non-linear electrical device;

said series-connected combination of said resistor and said nonlinear electrical device being coupled in series with said primary winding and in parallel with said contact breaker.

- 2 -

An ignition system according to claim 1, wherein:

said resistor has a relatively low value of resistance.

- 3 -

An ignition system according to claim 1, wherein:

said resistor comprises a variable resistor having a variable low value of resistance.

- 4 -

An ignition system according to claim 1, 2 or 3, wherein:

said nonlinear electrical device comprises a gas-filled discharge tube.

Abstract of the Disclosure

An ignition system includes an ignition coil having a primary winding adapted for connection to a battery and a secondary winding adapted for connection to a distributor. A contact breaker, shunted by a capacitor, is series-connected to the primary winding. A resistor of a low resistance and a gas-filled discharge tube are connected in series with each other, and are connected across the capacitor. When the contact breaker is opened, the gas-filled discharge tube constitutes a temporary place for a counter electromotive force to go because its internal resistance is very small during discharge. When the contact breaker is closed, only the capacitor is discharged since the discharge tube has a high internal resistance at this time.

Fig.5

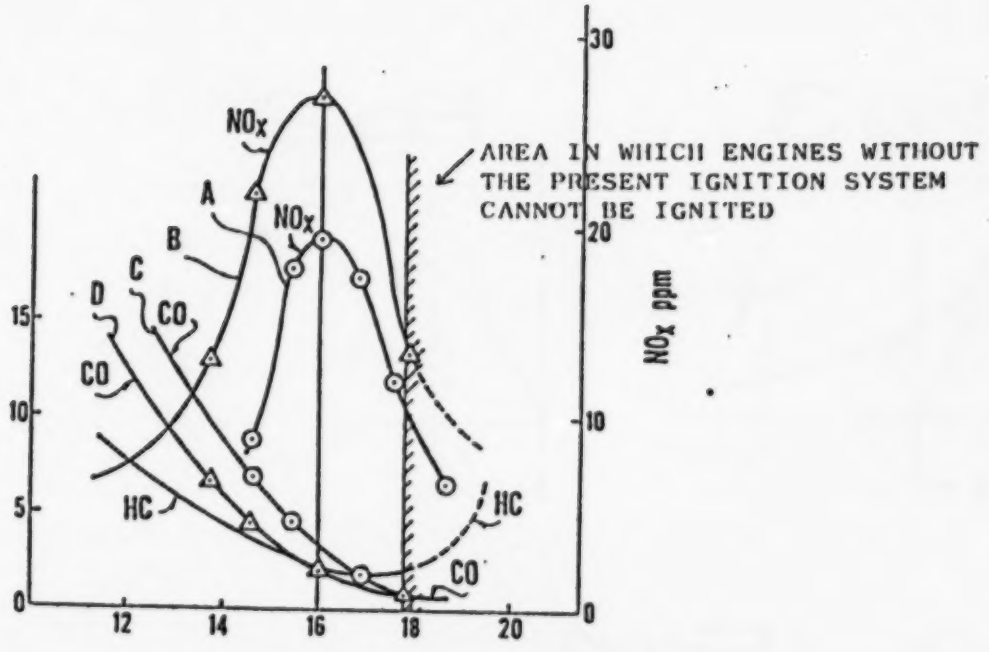
AREA IN WHICH ENGINES WITHOUT
THE PRESENT IGNITION SYSTEM
CANNOT BE IGNITED
NOx
NOx
A
B
C
D
CO
CO
HC
HC
CO
NOx ppm
0
5
10
15
0
10
20
30
12
14
16
18
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Fig. 1

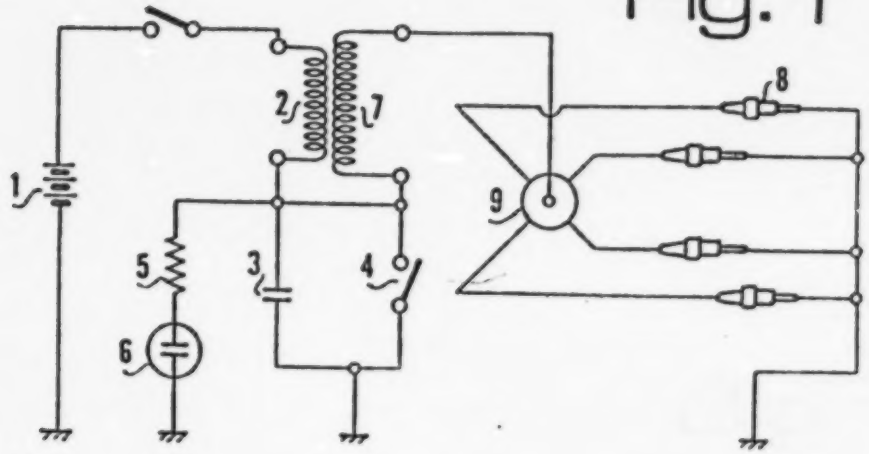



Fig. 3

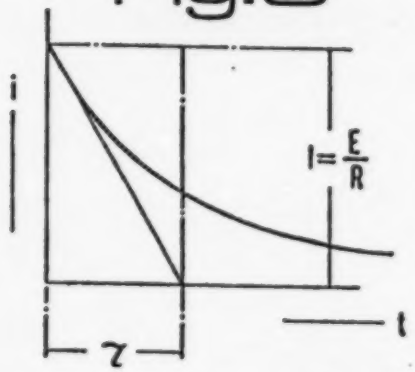



Fig. 2

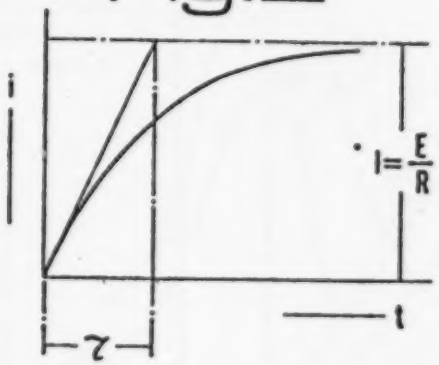


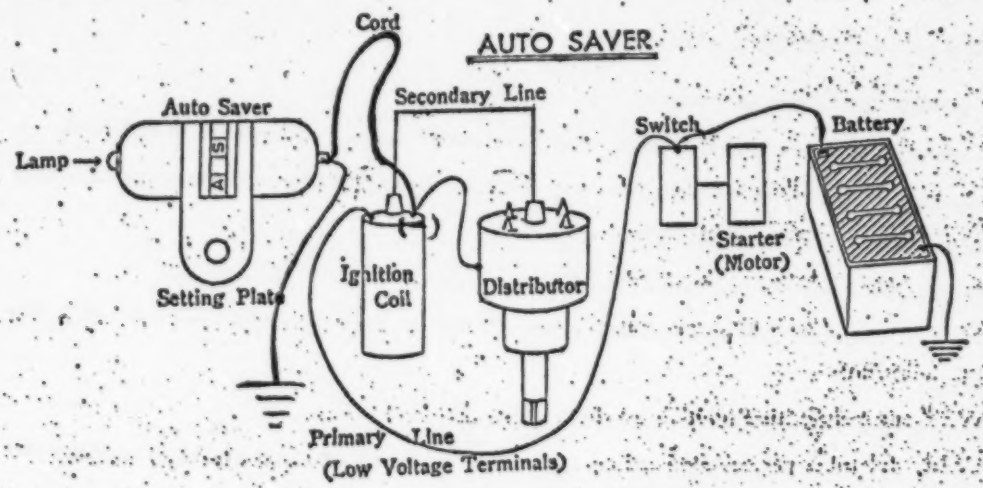

Fig. 4

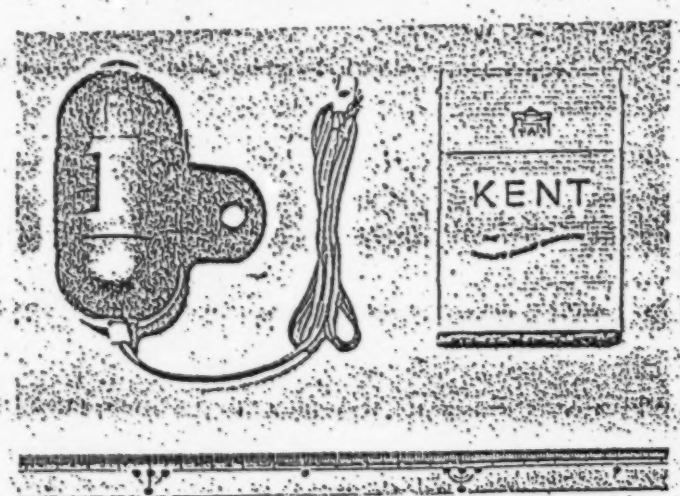
# ®AUTO SAVER

## METHOD OF INSTALLATION

Installation of Auto Saver is quite simple.

1. To install the Auto Saver by connecting the lead wire with (+) and (−) terminals of Primary Line (low voltage).
2. To be careful not to have the Primary line touch the Secondary line, and also at the same time, be careful not to let it slacken down.



# ®AUTO SAVER

## FEATURES AND EFFICIENCIES

AUTO SAVER is a compact precision built unit for automobile gasoline saving ignition device for perfect combustion. It helps to improve the performance of the electrical system and engine. Eight years of research have been expended into this product and through numerous test under every known conditions has resulted in the development of a product with 100 % efficiency.

Its FEATURES and ADVANTAGES are as follows:

1. AUTO SAVER helps on fuel consumption. Actual tests have shown savings of between 10 and 20 %.
2. AUTO SAVER increases engine horsepower, causing less strain on the engine and improves its performance.
3. AUTO SAVER helps prolong the life of BATTERY.
4. AUTO SAVER helps prolong the life of SPARK PLUGS.
5. AUTO SAVER helps to keep ENGINE LUBRICANT clean. Perfect combustion result with less carbon contaminate the lubricant.
6. AUTO SAVER ensures positive ignition even wh[illegible] the battery is weak.
7. AUTO SAVER, due to its perfect combustion, causes less carbon monoxide gas through the exhaust system.
8. AUTO SAVER is constructed attractively and is ornamental.
9. AUTO SAVER helps in distributing proper electrical current to eliminate unnecessary sparking at contact points.

## INSTALLATION :

AUTO SAVER is applicable to any gasoline engine with electrical ignition system. To install, simply connect the two lead wires to your ignition coil terminals.

The life of the AUTO SAVER is semi-permanent, but the life of the neon tube fitted into the unit is approximately 2,000 to 3,000 hours. In other words, if your car operates about 100 kilometers daily, the neon tube will last for about 3 to 5 years.

## PATENT : Number 997312

F7§(1)

2. Test Result.
The result of the test is as listed below: Further, the driving output worked from the driving torque and revolutions, and fuel consumption rate per HP are also listed for reference.

| Speed Km/h | 40 | | 60 | | 80 | |
|---|---|---|---|---|---|---|
| Condition | Auto Saver | | Auto Saver | | Auto Saver | |
| Item | Without A | With B | Without A | With B | Without A | With B |
| CO (Carbon Monxide Gas) Value % | 5.2 | 2.8 | 4.4 | 2.4 | 6.5 | 2.1 |
| CO Reduction Rate: $\frac{A-B}{A} \times 100\%$ | 46.1 | | 45.4 | | 67.7 | |
| Fuel Consumption Time s/20 co | 11.4 | 13.1 | 7.4 | 9.9 | 5.4 | 7.2 |
| Consumption amount co/h | 6310 | 5500 | 9730 | 7270 | 14670 | 10000 |
| Reduction Rate: $\frac{A-B}{A} \times 100\%$ | 12.8 | | 25.3 | | 31.8 | |
| For Reference: | | | | | | |
| Revolution (rpm) | 1550 | 1550 | 2300 | 2300 | 3050 | 3000 |
| Driving Torque Kg-m | 15.0 | 16.5 | 17.5 | 16.0 | 16.0 | 14.0 |
| Driving Output HP | 32.4 | 35.7 | 56.0 | 51.4 | 68.1 | 58.6 |
| Consumption per Driving Output cc/HP.h | 194.8 | 154.1 | 173.8 | 141.3 | 215.4 | 170.8 |
| Reduction Rate: $\frac{A-B}{A} \times 100\%$ | 20.9 | | 18.7 | | 20.7 | |

Tokyo, August 26, 1968.

THE BOARD OF INDUSTRY ENCOURAGEMENT
TOKYO METROPOLITAN GOVERNMENT

Yasuyuki Kimura, Director.

Attachment D

AESi

AUTOMOTIVE ENVIRONMENTAL SYSTEMS, INC. ■ 7300 BOLSA AVENUE, WESTMINSTER, CALIFORNIA 92683 ■ 714-897-0333
A subsidiary of Clayton Manufacturing Company

July 8, 1980

Mr. Mori
Sanwa Kagaku USA, Inc.
Empire State Building
Suite 5620
New York, NY 10001

Dear Mr. Mori:

It has been a pleasure to assist you and your company by performing these emissions tests and hope that we may be of help in any future testing programs that you may have.

The results of these tests, tabulated on the accompanying sheets, are expressed in the following units of measure: hydrocarbons (HC), carbon monoxide (CO), carbon dioxide ($CO_2$), and oxides of nitrogen corrected for humidity (NOxC), are all expressed in total grams of pollutant per vehicle mile. The fuel consumption, expressed in miles per gallon (MPG), is calculated from the mass emission data using the carbon atom balance technique.

AESi's testing laboratory is checked daily to ensure continued certification for on-going EPA contract testing.

The vehicle was operated through an EPA prescribed driving schedule for preconditioning before performing each test. The tests were performed on Indolene clear test fuel.

The results from these tests are only applicable to the specific test vehicles and may not be extrapolated to the vehicle population in total. No conclusions should be drawn from these test results, other than as they pertain to the specified vehicles tested. You are reminded of the Testing Agreement restrictions not to use AESi's name or letter of results or parts thereof in connection with any advertising or sales promotion without prior written approval from an officer of AESi.

AESi looks forward to having the opportunity of serving you again, and if you have any questions regarding these tests, please feel free to contact me.

Sincerely,

Alan D. Jones
Project Engineer

AUTOMOTIVE ENVIRONMENTAL SYSTEMS, INC.

EXHAUST EMISSIONS TESTS
CONDUCTED FOR SANWA KAGAKU U.S.A. INC.

VEHICLE DESCRIPTION

| | | | |
|---|---|---|---|
| Year: | 1980 | Displacement: | 302 cu. in. |
| Make: | Ford | Transmission: | AOD |
| Model: | Thunderbird | Device Tested: | Auto Saver |

Without Device

Test #1 (June 11, 1980)

| | HC | CO | $CO_2$ | NOxC | MPG |
|---|---|---|---|---|---|
| FTP | 0.443 | 1.891 | 579.755 | 0.800 | 15.18 |
| HFET | 0.105 | 0.190 | 359.315 | 0.781 | 24.64 |

Test #2 (June 20, 1980)

| | | | | | |
|---|---|---|---|---|---|
| FTP | 0.332 | 1.679 | 576.514 | 0.596 | 15.28 |
| HFET | 0.112 | 0.240 | 361.774 | 0.585 | 24.48 |

With Device

Test #3 (June 24, 1980)

| | | | | | |
|---|---|---|---|---|---|
| FTP | 0.288 | 1.530 | 560.211 | 0.642 | 15.74 |
| HFET | 0.108 | 0.249 | 359.359 | 0.596 | 24.63 |

Test #4 (June 25, 1980*)

| | | | | | |
|---|---|---|---|---|---|
| FTP | 0.396 | 3.337 | 568.932 | 0.597 | 15.41 |
| HFET | 0.205 | 1.718 | 341.064 | 0.541 | 25.75 |

Test #5 (June 27, 1980)

| | | | | | |
|---|---|---|---|---|---|
| FTP | 0.263 | 0.980 | 565.535 | 0.677 | 15.63 |
| HFET | 0.113 | 0.270 | 354.658 | 0.642 | 24.97 |

Certified: July 8, 1980

Alan D. Jones
Project Engineer
Technical Services

*Due to an unexplained vehicle malfunctions, test #4 was rerun as test #5 to check for data repeatability.

AUTOMOTIVE ENVIRONMENTAL SYSTEMS, INC.

FUEL ECONOMY - FLOW METER METHOD

Without Device

| TEST | ODO | GAL | MPG | ODO | GAL | MPG |
|---|---|---|---|---|---|---|
| 1 | 11.0 | 0.70 | 15.71 | 10.3 | 0.45 | 22.89 |
| 2 | 10.3 | 0.70 | 14.71 | 10.1 | 0.41 | 24.63 |
| With Device | | | | | | |
| 3 | 11.1 | 0.69 | 16.09 | 10.2 | 0.42 | 24.29 |
| *4 | 12.1 | 0.71 | 17.04 | 11.3 | 0.42 | 26.90 |
| 5 | 11.2 | 0.69 | 16.23 | 9.4 | 0.43 | 21.86 |

*Due to an unexplained vehicle malfunction, test #4 was rerun as test number 5 to check for data repeatability.

Certified: July 8, 1980

Alan D. Jones
Project Engineer
Technical Services

Attachment E

January 19, 1980

Mr. Mori
Empire State Building
Room 5620
New York, NY 10001

Dear Mr. Mori:

This is in response to your telephone call of January 3, 1980. Enclosed are the documents, EPA Retrofit and Emission Control Device Evaluation Test Policy, Application Format for use with the Fuel Economy Retrofit Device Evaluation under Section 511 of the Motor Vehicle Information and Cost Savings Act and Federal Regulations pertaining to this Act.

It is hoped this information will be of value to you.

Sincerely,

FPH

F. Peter Hutchins, Project Manager
Technology Assessment and Evaluation Branch

Enclosures

Attachment F

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

ANN ARBOR, MICHIGAN 48105

OFFICE OF
AIR, NOISE AND RADIATION

November 7, 1980

Mr. Y. Mori
Sanea Kagaku (U.S.A.) Inc.
Empire State Building, Suite 5620
New York, NY 10001

Dear Mr. Mori:

This is to advise you that your application for evaluation of the Auto Saver device under Section 511 of the Energy Policy and Conservation Act has been forwarded to the EPA Engineering Evaluation Group, where it will be analyzed according to the requirements of the regulation. They will review the material submitted with your application and determine if EPA testing is warranted.

We will contact you if further information is needed with respect to your application.

Sincerely,

Merrill W Korth

Merrill W. Korth, EPA Device Evaluation Coordinator
Test and Evaluation Branch

Note: This letter was undeliverable by the Post Office since the Applicant had moved and left no forwarding address.

Attachment G

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ANN ARBOR, MICHIGAN 48105

OFFICE OF
AIR, NOISE AND RADIATION

November 28, 1980

Mr. Y. Mori
Sanwa Kagaku (U.S.A.) Inc.
Empire State Bldg., Suite 5620
New York, N.Y. 10001

Dear Mr. Mori:

The EPA Engineering Evaluation Group has conducted an initial review of your firm's application for evaluation of the "Auto Saver" under Section 511 of The Motor Vehicle Information and Cost Savings Act. The following information is required prior to any further evaluation of your device.

- What is Dr. Giichi Mori's association/title with the device manufacturer (Sanwa Kagaku Co., Ltd.)?

- The majority of the data provided with your application for evaluation is in Japanese. Please provide an English translation of these data to include a description of the test procedures, test vehicles and test conditions used to obtain those results. Also, please describe all maintenance both prior to and during this testing.

- Please clarify the applicability of the device. The patent description references use of the device with conventional contact breaker point ignition systems, yet your application indicates that the device is applicable to "all kinds of cars, as long as cars have ignition systems". If the device is applicable to solid state, high energy, ignition systems, please provide device installation instructions for such systems and additional data on 1975-1980 model year vehicles to support your application.

Regarding your letter of July 8, 1980, the following information is required for the provided data to be considered with your application for device evaluation:

- How was the device installed on the test vehicle (1980 Ford Thunderbird)?

- To what specifications were the engine design parameters (air-fuel ratio, ignition timing, etc.) set for both the baseline and device installed testing?

- Please describe all maintenance/adjustments performed both prior to and during this testing.

'Please provide background information relative to the test procedures and test conditions (inertia test weight, dynamometer power absorber setting, ambient temperature, etc.) used to obtain these results.

'How many vehicles were used to obtain the provided test results?

Thank you for your cooperation and I look forward to your rapid response so that your application can be processed further. If you have any questions regarding the desired information, please feel free to contact my office (313-668-4299).

Sincerely,

Merrill W. Korth

Merrill W. Korth, EPA Device Evaluation Coordinator
Test and Evaluation Branch

cc: F. P. Hutchins
R. N. Burgeson

Note: This letter was undeliverable by the Post Office since the Applicant had moved and left no forwarding address.